The Centipede-Whale.

Besides the passage in Aelian about the *Scolopendra cetus*, quoted in your paper of September 9 by Mr. Minakata, there are epigrams of Theodoridas of Syracuse, and Antipater of Sidon (third and second centuries B.C.), referring to something of the sort. Aristotle's marine *Scolopendra*—a small animal—is, of course, not in point. W. F. Sinclair.

102 Cheyne Walk, Chelsea, S.W., September 10.

NOTES.

On the formation of the British Section of the Pasteur International Memorial, the Secretary, Prof. Percy Frankland, F.R.S., forwarded a circular to India, and invited admirers of Pasteur there to form an Indian Section for the collection of contributions. Surgeon Major-General Cleghorn, who undertook the secretaryship of this section, has now transmitted a list of subscribers together with the substantial sum of 442*l.* 17*s.* 3*d.* to be sent on to Paris. Amongst the centres which have forwarded contributions we find Bengal, Madras, Bombay, the Punjab, Central India, Central Provinces, North-west Provinces and Oudh, Assam, Burma, Rajputana, Berar, and Baluchistan; thus indicating how widely appreciated the services of Pasteur are in our Indian Empire.

Referring to the ascent of Mount St. Elias, which was accomplished by the Duke of the Abruzzi (Prince Louis of Savoy) and his companions on July 31, the New York *Nation* remarks:—The two facts of special significance to which the dispatches announcing Prince Louis' success call attention are: the determination of the mountain's altitude, and the demonstration that it is not of volcanic origin, but simply a mass of elevated and partially upturned sedimentary strata, largely fossiliferous in character. The altitude, as computed by the mercurial barometer, is 18,060 feet, a result surprisingly in accord with the determination, by angle measurement, of Prof Russell, who obtained "18,100, plus or minus a probable error of 100 feet." Earlier measurements of the mountain ranged from less than 13,000 feet (La Pérouse, in 1786) to approximately 19,500 feet (Dall, 1874). It is probably safe to accept the present measurement, which places St. Elias—barring a possible excess in favour of the neighbouring Mount Logan—as the second mountain in point of elevation on the North American continent, the place of honour belonging to the Citlaltepetl, the Star Mountain—better known as the Peak of Orizaba—of Mexico, to which the determinations of Heilprin (1890, aneroid), Scovell (1891, triangulation), and Kaska (1897, mercurial barometer) give 18,2(3)00 feet. The non-volcanic nature of Mount St. Elias had already virtually been determined by Prof. Russell, but it will be a satisfaction to geologists to know that Prince Louis' studies of the mountain for the 4000 feet left untouched by Russell confirm this investigator's general conclusions.

Mr. J. E. Duerden, Curator of the Jamaica Institute Museum, has sent us a short account of the researches in marine biology carried on this year at Port Antonio by students of the Johns Hopkins University, under the direction of Prof. J. E. Humphrey. A number of important investigations were advanced, and the material collected by the party will, no doubt, form the basis of important contributions to natural history. Prof. J. E. Humphrey studied and collected material in connection with the structure and development of plants of various groups.—Dr. F. S. Conant visited Jamaica this year to continue investigations begun by him last summer upon the *Cubomedusæ*, a rare group of jelly-fish of which two species have been found in extraordinary abundance in Jamaican waters.—Dr. H. L. Clark continued the work which he began last summer on the Echinoderms (star-fish, sea-eggs, sand-dollars, sea-cucumbers, &c.) of the island, giving especial attention to the Holothurians or "sea-cucumbers"—forms of life which are very abundant around Jamaica.—Mr. Sudler, who was also a member of last year's party, continued the collection of material exhibiting the metamorphosis, or changes during the life-history, of *Lucifer*, one of the small Crustacea which shows some very important developmental features.—Mr. Grave worked upon the sea-stars or Ophiurians, and collected twelve or more species, only five of which have been previously recorded from Jamaica. The eggs of one of the species were artificially fertilised in the laboratory, and a complete series of the embryos, from the single cell to the fifteen-day Pluteus stage, has been preserved and will be further studied.—Mr. E. N. Berger devoted his time mostly to the Insects, Arachnids (spiders, scorpions, &c.), and Myriapods (centipedes and millipodes), paying special attention to the pseudoscorpions. The pseudoscorpions are small animals, the largest collected not measuring over three-sixteenths of an inch in length. A few specimens of a second species of pseudoscorpion, smaller and more active than the first-mentioned, were collected. One interesting point determined is the building of a small nest from fragments of rotten wood, the nest being evidently lined by the animal with a fine silk when about to shed its skin. The embryo lies as if dead in this little nest, and after a time emerges with its appendages of a very pale green, which later turns to the normal brown. Little is known of the development of the pseudoscorpions, and it is expected that the material collected will aid in throwing some light on the group —Mr. Duerden devoted himself to the Actiniaria in furtherance of the work already carried out on the south side of this island. A new species of *Bunodeopsis* was discovered, several previously obscure species were recovered, and a supply of embryological material preserved for further research.

With the foregoing account of this summer's work in the Johns Hopkins marine laboratory, comes to us the news of the death of Prof. Humphrey, who was in charge of the students at Port Antonio. Prof. Humphrey was only a little over thirty years of age, but his scientific works had stamped him as a botanist of much promise. He was associate professor of botany at the Johns Hopkins University, Baltimore. He graduated at Harvard University some years ago, taking the degree of Sc.D. It is significant of the position he held in the estimation of his American colleagues, that he formed one of the Botanical Commission which lately visited Jamaica to determine the best site for a botanical station. A few years ago he paid a visit to the island in connection with the Johns Hopkins University, to investigate the fauna. During the recent sojourn, which has ended so disastrously, he devoted himself principally to collecting embryological material for the benefit of his students at Baltimore, and especially material of the shell-boring algæ in reference to which he had already published his researches. His death will be deeply regretted in the botanical world.

From an obituary notice in the *Lancet* we have obtained the following particulars of the work of Dr. J. Braxton Hicks, F.R.S., whose death we announced last week. Dr. Hicks was born in 1823. He obtained the M.D. of the University of London in 1851, and in the following year was elected a Fellow of the Linnean Society. Ten years later he was elected to the Fellowship of the Royal Society. To medical and scientific journalism Dr. Braxton Hicks was a valued and voluminous contributor; he also published many papers in Italian, American, and Australian medical journals. From his boyhood upward he was a devoted student of natural science, and he published a number of papers on original subjects in the *Proceedings* of the Royal Society. Among these may be noted "Eyes of the Invertebrata" and "Supplementary Forces concerned in the Circulation of the Uterus." To the *Transactions* of the Linnean Society he contributed many papers on zoology and botany, and described many groups of sensory organs on the surface of insects. In the same *Transactions* he also published papers on original researches on the "Lichens, Mosses, and Unicellular Algæ"; and papers on "Volvox Globator, Amœboid Vegetable Bodies," and "Gonidia of Lichens" were contributed by him to the *Microscopical Journal*.

THE meeting of the Australasian Association for the Advancement of Science, to be held at Sydney next January, promises to be an important one. A large number of papers have been promised to the different sections, among them being: "The Classification of Eucalypts," by J. G. Luckmann; "A Statistical Account of Australian Fungi," by D. M'Alpine; "The Algæ of Victoria," by H. T. Tisdell; "Flowers of the Order Proteaceæ," by J. Shirley; "Underground Fungi of Tasmania," by R. Rodway; "Australian Oceanography," by T. W. Fowler; "On the Formation and Structure of Coral Reefs," by J. J. Wild; "The Dialectic Changes of the Indo-Polynesians," by the Rev. S. Ella; "The Oceanic Peoples," by E. Tregair; "The Ancient Geography of the Maoris," and "The Geographical Knowledge of the Polynesians," by S. Percy Smith; "Old Samoa" and "Australian Cave Paintings," by the Rev. J. B. Stair; "Ancient Maori Rites and Customs," by Mr. Elsdon Best; "The Teaching of Mechanical Drawing in State Schools," by J. Plummer; "The Characteristics of Australian and other Diamonds," by E. W. Streeter; "A Series of Microphotographs of Bacteria," by Dr. Frank Tidswell; "The Rationale of Miraculous Cures in Modern Days," by Dr. S. T. Knaggs; "Fact and Idea," by J. C. Brennan; and "Scientific Methods as applied to Modern Education," by Miss E. A. Badham.

THE death is announced of Mr. John Darlington, a well-known mining engineer, and author of a number of works on mining and metallurgy.

THE sixteenth annual congress of the Sanitary Institute opened at Leeds on Tuesday, and the President, Dr. Farquharson, M.P., delivered an inaugural address.

THE eighth annual meeting of the Federated Institution of Mining Engineers was held on Tuesday in Edinburgh, under the presidency of Sir Lindsay Wood.

THE energetic Secretary of the Society for the Protection of Birds has issued another letter of protest against the wanton destruction of birds to supply ladies with wings and feathers and stuffed skins for their bonnets. The Society is unceasing in its efforts to open the eyes of the gentler sex to the cruelty often practised in procuring plumes, and to the gradual extermination of many beautiful and beneficial birds. We regret to think, however, that such trifling matters do not disturb the minds of the majority of women when they choose their millinery. Present effect is to them the sole criterion of the value of a bonnet, and how the effect is produced they complacently leave others to inquire.

ATTENTION has already been called to the fact that the collation of the enormous mass of evidence collected by the Indian Geological Survey with regard to the great earthquake of June 12, is now being carried on under the supervision of Mr. R. D. Oldham. It is as yet too early for any final opinions to be expressed, but some of the preliminary results are of interest as showing the power of the shock. The area affected is stated to be greater than that of the Lisbon earthquake. The earlier reports as to the damage were exaggerated; but it was nevertheless very serious, as can be readily believed, as the cylinder seismometer at Shillong indicates that the shock consisted of an oscillation of 7·4 inches at the rate of 60 times a minute. All the masonry was accordingly simply shattered to pieces, rather than overthrown. Mr. Oldham's conclusions as to any possible connection between the earthquake and a continued uplift of the Himalaya will be awaited with much interest.

THE systematic position of the Dictyotaceæ has been a frequent subject of inquiry among algologists. The occurrence of tetrasporangia and of non-motile male cells has even led some to suggest an affinity with the Florideæ. Crouan was, however, of opinion that the so-called spermatia were motile; but Thuret, after a careful investigation, concluded that they were, like the similar bodies in the Florideæ, devoid of cilia, and incapable of movement. Later Johnson thought he saw evidences of ciliary movement in *Dictyopteris*, another genus of the same family. Mr. J. Lloyd Williams has now clearly established by repeated observations, carried on during this and last summer, that the antherozoids of *Dictyota* and *Taonia* are actively motile like those of Fucaceæ. It is evident that this is an observation of great importance, and botanists will look forward to the publication of details. The work has been conducted in the Botanical Laboratory of University College, Bangor, the situation of which on the shore of the Menai Straits afforded excellent facilities for the investigation.

THE wonderful expansion of mining enterprise in the West Kootanie district of British Columbia during the past few years, and the extent and richness of the deposits carrying silver and gold there, are referred to by Dr. G. M. Dawson in the latest Report (vol. viii., 1895) of the Geological Survey of Canada. One of the most noteworthy points brought out by the field-work of Mr. McConnell is the occurrence, lately ascertained, of ores of exceptional richness in parts of the granite area, which has hitherto been almost disregarded by the miners. In the Rainy Lake and Thunder Bay districts of Western Ontario, surveys have been made by Mr. McInnes in connection with the development and definition of the auriferous quartz veins and iron ores. The rocks characterising the country are divisible, in a general way, into Laurentian and Huronian; and it is in the latter that minerals of value are found to occur. Dr. Dawson states that some assays of quartz from the Manitou and Seine River regions prove the existence of quartz-veins exceptionally rich in gold, of which it only remains to determine the extent and continuance in depth. A survey of the Noddaway River in Northern Quebec, by Dr. Bell, resulted in the important geological discovery that a great area of the Huronian system exists to the north of the main watershed.

A SIMPLE experiment for determining the source of the rays from a "focus" tube is described by Dean Molloy in the *Scientific Proceedings of the Royal Dublin Society* (vol. viii. part v. 59). Dr. Molloy took a deal board measuring seven inches by five, and into it drove fifteen slender nails in three rows of five; this was attached to the back of a fluorescent screen mounted on a stand so contrived as to allow of the apparatus being revolved in a circle about the focus tube, with the screen always tangential to the circle. By noting the directions of the shadows of the nails, the exact position of the source of radiation could be determined. On adjusting the focus tube so that the central nail pointed towards the platinum plate in all positions of the screen, it was found that this nail gave only a black spot for its shadow, the shadows of the other nails radiating symmetrically from this spot as centre. It followed that the source of radiation was in the line of the central nail produced, and was thus shown to be at or about the centre of the platinum plate. Dr. Molloy then proceeded to determine the size of the area of radiation by means of a pin-hole image, and found it to be an irregularly circular ill-defined patch about a quarter of an inch in diameter, coinciding with the patch which first begins to glow when the current is turned on.

IN the *Atti dei Lincei*, vi. 4, Prof. Domenico Mazzotto gives a continuation of his observations on the electro-magnetic indices of refraction of woods. The object of the new experiments was to ascertain whether the principal indices of refraction were proportional to the square roots of the dielectric constants in the same directions, in accordance with Maxwell's theory. In the case of beech (and presumably other woods) this relation was found to be satisfied. On drying the wood, both the dielectric constants and the indices of refraction diminished correspondingly.

IN the *Rendiconto* of the Naples Academy (iii. 7), Dr. R. V. Matteucci announces the discovery for the first time of the elements iodine and bromine among the products of the fumaroles of Vesuvius. It will be remembered that only quite recently the same author discovered selenium in a similar locality.—Prof. Domenico de Francesco gives an elegant mathematical investigation of the equations of vertical motion of a balloon in free air on the assumption of Newton's law of resistance.—Prof. E. Villari gives a note on the discharging property produced in gases by certain compounds of uranium, first discovered by Becquerel.

SEVERAL partial accounts of Prof. Vicentini's valuable microseismograph have already appeared, but for the first time a complete description is given in a memoir by Dr. G. Pacher (*Atti del R. Ist. Veneto di scienze*, t. viii., 1897, pp. 1-62). The instruments described are the original form of the microseismograph, in which the length of the pendulum is 1·5 m., and its mass 100 kg., and the latest form, in which the length is 10·7 m. and the mass 408 kg. Detailed instructions are given for erecting the apparatus in a suitable place, for putting the different parts together, preparing the smoked paper, &c. There are also brief accounts, with useful bibliographies, of other instruments, such as the horizontal pendulums of von Rebeur-Paschwitz and Milne, the bifilar pendulum of H. Darwin, the vertical pendulums of Agamennone and Cancani, and the geodynamic levels of Grablovitz.

A PHYSICAL theory of the electrical phenomena of the higher atmosphere is briefly described by M. Marcel Brillouin in the *Revue Générale des Sciences* (August 30). It is now well known that any metallic body charged negatively, loses its charge when exposed to ultra-violet light. Experiments carried out in the physical laboratory of the Ecole Normale in Paris have shown that dry ice behaves like a metal, when charged with negative electricity and exposed to ultra-violet radiations. When the ice has a film of water upon it, however, the loss of electricity is extremely small. As cirrus clouds consist of ice needles, and receive ultra-violet radiations from the sun, negative electrification may pass from the needles into the surrounding air, leaving the cloud particles charged positively. This is the basis of the theory, which is summed up by M. Brillouin as follows: (1) atmospheric electricity is produced by the action of ultra-violet solar radiations upon the ice needles in cirrus clouds; (2) the initial electrical field is produced by the movements of the higher regions of the atmosphere relatively to the earth's magnetic field.

THE *Bulletin de la Société de Geographie* contains a suggestive paper by Prof. J. Thoulet on the great need for better maps of the seas and oceans. Maps of those regions are no longer exclusively of interest to the navigator—almost every scientific man is now more or less concerned with oceanography in some of its aspects, and every day raises new practical problems connected with cables, fisheries, submarine mines, &c.—nevertheless the best accessible sea-maps are small of scale and mostly out of date. Oceanographers know that the average current-chart, faithfully copied from one atlas to another, is a disgrace to modern knowledge, but it may be doubted if the time is yet ripe for an elaborate "Sea Atlas" of large-scale maps. The scheme proposed and ably worked out by Prof. Thoulet in the second part of his paper cannot, however, be undertaken too soon. It is proposed, by careful drawing of lines on the large-scale charts, to prepare accurate contour maps of the whole of the sea-bottom within 200 metres of the surface, and then, by enlisting volunteer observers, to collect sufficient material to allow of accurate lithological classification of the deposits on the continental shelf. The distribution of these deposits could be shown by colouring on the contour charts, and we should thus be put in possession of an accurate representation of the relief and geological formation of one of the most interesting and important regions of the globe. Prof. Thoulet suggests that the deposits should be arranged under four headings: "sand," "muddy sand," "sandy mud," and "mud"; the different sorts being determined when necessary by mechanical analyses. The paper contains details referring to the French coasts, but the work is even more needed in this country.

THE publication is announced of a new "Journal of American Science," under the name *Orcutt*. The *Journal of Botany* quotes the following paragraph from the prospectus:—"No complimentary copies; no free samples; no exchanges; no advertisements in the text; no premiums; no discount to agents; the whole income going to make it better and larger. Botany and horticultural science will receive the greatest attention in the first numbers; botanists are invited to publish new species in its pages."

THE Report from the Curator, Lieut.-Colonel King, of the Royal Botanic Garden, Calcutta, for the year 1896-97, is one of considerable disaster; both that garden and the Lloyd Botanic Garden at Darjeeling having suffered much from the drought of that year, following the drought of 1895-96. Notwithstanding this, much useful work has been done in the cultivation of economic plants, the investigation of the flora of British India, and the enrichment of the herbarium. A monograph has been published of the Indian species of bamboo, by Mr. J. Sykes Gamble.

THE following are among the papers and other publications which have come under our notice within the past few days:—"On the Magnetic Properties and Electrical Resistance of Iron as dependent upon Temperature," by Dr. David K. Morris. This paper was read before the Physical Society last May, and is published in the *Philosophical Magazine* for September. The general character of the work and results are described in NATURE of May 20 (p. 70).—Prof. George H. Barton has sent us a report, reprinted from the *Technology Quarterly* (June), upon his "Glacial Observations in the Umanak district, Greenland." Prof. Barton was a member of the Boston party on the sixth Peary Expedition to Greenland, and his report is the second which has been published upon scientific work accomplished during the expedition.—"A Method of determining Magnetic Hysteresis Loss in Straight Iron Strips," by Prof. J. A. Fleming, F.R.S., read before the Physical Society on June 11 (see p. 166), and reprinted from the *Philosophical Magazine* for September.—The seventh and eighth parts of vol. ii. of Prof. G. O. Sars' "Account of the Crustacea of Norway" have just been issued by the Bergen Museum. The Desmosomidæ and part of the family of Munnopsidæ are described and illustrated.

THE additions to the Zoological Society's Gardens during the past week include a Smooth-headed Capuchin (*Cebus monachus*) from South-east Brazil, presented by Mr. W. R. Routledge; a Brown Capuchin (*Cebus fatuellus*) from Guiana, presented by Mr. C. Hardy; a Common Marmoset (*Hapale jacchus*) from South-east Brazil, presented by Mrs. C. J. Anson; an Ivory Gull (*Pagophila eburnea*) from the Arctic Regions, presented by Mr. F. G. Jackson; a Chameleon (*Chamæleon vulgaris*) from North Africa, presented by Mr. H. du Domaine; a King Parrot (*Aprosmictus cyanopygius*) from Australia, presented by

Dr. G. Granville Bantock; a Ring-tailed Coati (*Nasua rufa*), a Kinkajou (*Cercoleptes caudivolvulus*) from South America, deposited; an Indian Civet (*Viverricula malaccensis*) from India, a Chilian Sea Eagle (*Geranoaëtus melanoleucus*) from South America, purchased; a Patagonian Cavy (*Dolichotis patachonica*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

The Disintegration of Comets.—If a comet is regarded as a swarm of meteorites, *à priori* considerations point to disintegration as its ultimate fate. Schiaparelli and Bredichin have familiarised astronomers with this fact, and the Great Comet of 1882, as well as Brooks' Comet of 1889, were visible examples of the way in which cometary members of the solar system break up in their old age. M. M. O. Callandreau has a short article in the *Bulletin Astronomique* (September) upon this disintegrating tendency, and also upon the relation of Jupiter to comets of short period. The two subjects are very closely related, for there is evidence that individual orbits in the groups of comets of short period in the neighbourhood of Jupiter have been produced by a process of separation. What M. Callandreau has done is to estimate, in a general manner, the influence the trajectory described by the head of a comet has upon disintegration, and to determine the extent of the sphere of stability at different points of the orbit both when the sun's attraction is considered alone, and when it is considered with the action of Jupiter. The subject is dealt with entirely from a dynamical point of view, no account being taken of the influence of thermal radiation from the sun or of the apparent force of repulsion exercised by the sun upon cometary material. A comet is considered as a spherical swarm of particles, and the density of the swarm is either taken as uniform or varying uniformly with distances from the centre. It appears that the elliptical form of an orbit favours disintegration. The following consequences follow from equations obtained by considering the sun's action alone: (1) When the distance of the nucleus remains constant, the extent of the sphere of stability increases with increase of velocity. (2) The relation of the radii of the spheres of stability at aphelion and perihelion is approximately equal to $\left(\frac{1-e'}{1+e'}\right)^{\frac{2}{3}}$, where e' is the eccentricity of the orbit. As to the combined influence of the sun and Jupiter, it appears that if a comet gets within the Jovian sphere of attraction, the radius of which is 0·3 the radius of the earth's orbit, the disintegrating power upon the comet when near aphelion is equivalent to that of the sun upon a comet when at a perihelion distance of 0·58.

Forecast of the November Meteor Shower.—Mr. W. F. Denning continues, in the *Observatory*, an interesting paper upon "The Great Meteoric Shower of November," and predicts the probable character of the showers which will occur during the next six or seven years. His forecast for this year's display is as follows:—"In 1864 (two years before the max. of 1866), a grand display of meteors was witnessed from the deck of a ship off Malta on the morning of November 13, and meteors were conspicuously numerous on the same morning in America. We are therefore entitled to expect a pretty abundant display in 1897, and should it prove a return of the same group which supplied the meteors of 1864, it will probably return in the morning hours of November 14. But the earth will intersect a point of the meteoric orbit rather further in advance of the comet than it did in 1864, and so the exhibition of 1897 is not likely to equal the former, unless, indeed, the richer part of the stream has lengthened out in the interval of thirty-three years, which is quite possible. The really dense part of the system which furnished the brilliant European display of 1866 (max. Nov. 13, 13h. 10m.), and the equally imposing American shower of 1867 (max. Nov. 13, 22½h.), is not likely to be visible in England, as the earth will be centrally involved with it on the 14th at midday. In America something of it may possibly be seen just before sunrise on the 14th. The moon will be full on the morning of the 9th, and will therefore be gibbous on the 14th, rising at 7h. 55m. at Greenwich, and being visible in Gemini during the whole night afterwards. The prospects are therefore by no means good, but a close watch should be maintained on the mornings of the 14th, 15th, and 16th; for if the atmosphere be clear, meteors will sure to be frequent, and fine ones may appear every now and then."

THE RELATIONSHIP OF PHYSIOLOGY, PHARMACOLOGY, PATHOLOGY, AND PRACTICAL MEDICINE.[1]

The desire for knowledge which is common to the lower animals and man, savage or civilised, and has induced members of this Congress to come from the ends of the earth in order to gain information, must have led primitive man from the earliest times to study the great problems of physiology, the nature of life, of growth, of reproduction, and of death, as well as to notice the connection of the latter with mechanical injuries, such as the wounds inflicted by clubs and spears or by the teeth and claws of wild beasts.

Next to the problems of physiology come those of pharmacology, by which I mean the poisonous or remedial action of various substances, mineral, vegetable, or animal. A knowledge of this subject is found even amongst the lowest savages, and is of the greatest use to them, for it enables them, on the one hand, to avoid eating things which may cause discomfort, pain, or death, and, on the other, to obtain food by poisoning waters and thus catching fish, or by poisoning their arrows to kill game which would otherwise escape. Closely associated with the knowledge of the poisonous is that of the curative powers of herbs, and it is possessed by animals as well as man, for cows avoid noxious plants, and dogs will every now and again eat grass apparently as medicine. Primitive peoples use various substances as remedies in disease, with more or less success, and one of the most extraordinary points in their practice is that they seem to some extent to have forestalled the newest researches on venins, anti-venins, and organotherapy, for in Africa the Bushmen are accustomed to drink the poison of venomous snakes as a prophylactic against their bite, and the Hausas prevent hydrophodia by killing the mad dog and making the man it has bitten eat its liver.

The occurrence of death from wounds or poison is intelligible even to a savage, but when illness and death occur independently of these, men naturally attribute them to invisible powers. Thus the Dyaks of Borneo ascribe sickness to wounds from invisible spears weilded by invisible spirits, and during an epidemic of disease in the Middle Ages the cry often arose that the wells had been poisoned. These crude ideas contain germs of truth, and when we look at Prof. Metschnikoff's drawings of a Daphnia attacked by a Monospora we seem to recognise the invisible darts of the Dyaks, while during an epidemic of typhoid fever we have often to acknowledge that our wells have been poisoned by bacilli.

It is impossible to trace the steps by which the crude ideas of savage peoples regarding physiology, pharmacology, and pathology have grown into definite sciences, nor even to indicate the most important landmarks, though we naturally think of the names of Alkmaon, Galen, and Harvey in physiology; of Nicander, Magendie, and Bernard in pharmacology; and of Morgagni, Virchow, and Pasteur in pathology. During this century these three sciences have developed with almost incredible rapidity, a complete knowledge of them is enough to tax severely the most retentive memory, and it is almost impossible for any individual to keep up with the advance of all three of them.

But just as the whole subject of astronomy became suddenly simplified by a change of standpoint at the very time when cycles and epi-cycles became most bewildering, so at the very time when these three sciences are becoming most complex and diverse they appear to be tending to unification and simplification. Pathology, for example, is now becoming to a great extent a branch of pharmacology, for while a few years ago its chief object was to discover, examine, and classify the microbes which give rise to disease, it is now striving rather to discover the nature and actions of the ferments and poisons which they form, and by which they are able to cause disease and death in the animals they attack. Pharmacological investigation instead of being confined to the alkaloids and other poisons formed by higher plants has now extended to those formed by microscopic plants or microbes, and thus comes to include a great part of pathology.

In the same way, though pharmacology is a branch of physiology, inasmuch as it deals with the phenomena of life as modified by drugs, yet physiology may, to a certain extent, be

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[1] An address delivered at the Twelfth International Medical Congress at Moscow, on August 19, by Dr. T. Lauder Brunton, F.R.S.